BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(MID SEMESTER EXAMINATION MO/2024)

CLASS: IMSc **SEMESTER: V**
BRANCH: MATHEMATICS **SESSION : MO/2024**

SUBJECT: MA303 FUZZY LOGIC

TIME: 02 Hours **FULL MARKS: 25**

INSTRUCTIONS:
1. The question paper contains 5 questions each of 5 marks and total 25 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
***4*. Tables/Data handbook/Graph paper etc., if applicable, will be supplied to the candidates**

			CO	BL
Q.1(a)	Consider a fuzzy set A defined on the interval X= [0,10] of real numbers by the membership grade function A(x)=x/x+2.Is fuzzy set A convex or not ?	[2]	1	I,II,III
Q.1(b)	Let A be a fuzzy set defined by A=0.5/a+0.4/b+0.7/c+0.8/d+1.0/e. List all α-cuts and strong α-cuts of A.	[3]	1	I.II.III
Q.2(a)	Let A = 0.3/Hans + O.4/John + 0.7/George + O.8/Young and B = 0.7/Hans + O.4/John + 0.1 /George + 0.3/Young be two fuzzy sets. Prove any one of De-Morgans rule for the above fuzzy set.	[2]	1	I,II,III
Q.2(b)	Consider the following two fuzzy sets A and B defined over a universe of discourse [0,5] of real numbers with their membership functions A(x) = x/1+x and B(x) = 2^{-x}. Determine the membership function of AUB ,A∏B and draw it graphically.	[3]	1	I,II,III
Q.3(a)	Let P={0.1/a+0.5/b+1/c} and D={0.4/x+0.8/y} be two fuzzy sets. Find PXD.	[2]	2	I,II,III
Q.3(b)	Let X={x1,x2,x3} ,Y={y1,y2},Z={z1,z2,z3} Let R be a fuzzy relation defined as	[3]	2	I,II,III

$$\begin{array}{c} \\ x1 \\ x2 \\ x3 \end{array}\begin{array}{c} \begin{array}{cc} y1 & y2 \end{array} \\ \begin{bmatrix} 0.6 & 0.2 \\ 0.3 & 0.9 \\ 0.7 & 0.5 \end{bmatrix} \end{array}$$

Let S be a fuzzy relation defined as

$$\begin{array}{c} \\ y1 \\ y2 \end{array}\begin{array}{c} \begin{array}{ccc} z1 & z2 & z3 \end{array} \\ \begin{bmatrix} 0.7 & 0.5 & 0.8 \\ 0.6 & 0.8 & 0.9 \end{bmatrix} \end{array}$$

Find ROS using max-min composition.

Q.4(a)	Is $E(x) = 1, x = 5$ = 0 , otherwise a fuzzy number?	[2]	2	I,II,III

PTO

Q.4(b)	Consider P= {P1, P2, P3} of four varieties of paddy plants, set D= {D1, D2,D3} of the various diseases affecting the plants and S={S1,S2,S3} be the common symptoms of the diseases . Let $\tilde{R}$ be a relation on PXD and $\tilde{S}$ be a relation on DXS	[3]	2	I,II,III

$$R = \begin{array}{c|ccc} & D1 & D2 & D3 \\ P1 & .6 & .6 & .9 \\ P2 & .1 & .2 & .9 \\ P3 & .9 & .3 & .4 \end{array} \qquad S = \begin{array}{c|ccc} & S1 & S2 & S3 \\ D1 & .1 & .2 & .7 \\ D2 & 1 & 1 & .4 \\ D3 & 0 & 0 & .5 \end{array}$$

Obtain the association of the plants with the different symptoms of the diseases.

Q.5(a)	Calculate α-cut interval of triangular fuzzy number A=(-4,2,5).	[2]	3	I,II,III
Q.5(b)	Let A= {(5,0.5), (6,1.0)}) & B= {(2,1.0), (3,0.4),(4,0.8)} be two fuzzy sets. Calculate A (+) B.	[3]	3	I,II,III

::::::23/09/2024::::::E